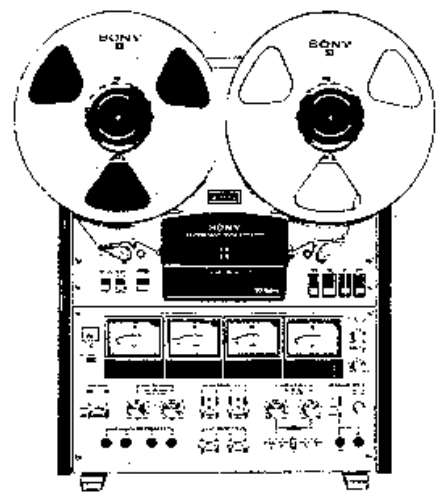
SONY®

4 CHANNEL STEREO TAPECORDER

TC-788-4

OWNER'S INSTRUCTION MANUAL



Precision, uncompromising quality, and superb quadraphonic or stereophonic sound . . . they are now yours with the exciting Sony TC-788-4.

Special features are:

- 15 ips, 10½-inch reel, 4-track 4-channel recording and playback operation.
- Ac servo-controlled capstan drive motor which provides constant speed regardless of voltage or load changes.
- Closed-loop dual capstan tape drive which assures positive tape-to-head contact and isolates external vibration.
- Logic-controlled function buttons which allow feather-touch, direct transport switching from any mode to another mode.
- Provisions for timer-controlled recording or playback.
- Separate tape equalization and bias selector switches to optimize the characteristics of any tape.
- PAN POT (panoramic potentiometer) facility which enables back-to-front channel mixing, especially useful for multi-mic stereo recordings.
- Synchro-track facility to allow synchronized recording of new tracks with previously recorded tracks.
- Direct coupling of the playback head to the FET in the first stage of the playback amplifier, resulting in better signal-to-noise characteristics.

Please read these instructions carefully to obtain maximum performance and enjoyment from your TC-788-4. The flexibility provided by its many features may not be fully appreciated unless you spend a little time gaining familiarity with its controls and facilities. Keep this manual handy for future reference.

photocopy for service-use only

WARNING

To avoid electrical shock, do not open the cabinet. Refer servicing to qualified personnel only.

To prevent fire or shock hazard, do not expose the set to rain or moisture.

OWNER'S RECORD

For your convenience, record the model number and serial number (you will find them on the rear of your unit) in the space provided below. Please refer to them when you contact your Superscope Service Station in case of difficulty. This will be a great help to you in getting better and more satisfactory service on your unit.

Model No. TC-788-4 Serial No. _____

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SPECIFICATIONS

Power requirements:	120 volts AC, 60 Hz
Power consumption:	120 watts
Tape speeds:	15 ips, 7½ ips
Recording time: (with 3,600 ft tape)	4-channel stereo recording: 45 minutes at 15 ips 90 minutes at 7½ ips 2-channel stereo recording: 90 minutes at 15 ips 180 minutes at 7½ ips Mono recording: 180 minutes at 15 ips 360 minutes at 7½ ips
Fast winding time:	2 min. 30 sec. with 2,400 ft tape (10½-inch reel)
Reels:	10½ inches or smaller
Track system:	4-track 4-channel stereo recording and playback 4-track 2-channel stereo 4-track mono
Heads:	1 record head, 1 playback head, 1 erase head
Motors:	Ac servo-controlled capstan motor: .....1 8-pole induction reel motors 2
Bias frequency:	160 kHz
Equalization:	NAB standard
Signal-to-noise ratio:	56 dB (SLH tape) 53 dB (standard tape)
Harmonic distortion:	1.2%
Frequency response:	With SLH tape: 20 – 35,000 Hz at 15 ips 30 – 28,000 Hz±3 dB at 15 ips 20 – 28,000 Hz at 7½ ips 30 – 23,000 Hz±3 dB at 7½ ips With standard tape: 20 – 30,000 Hz at 15 ips 20 – 23,000 Hz at 7½ ips
Wow and flutter:	0.04% at 15 ips, 0.06% at 7½ ips, WRMS
Inputs:	MIC inputs .....4 (phone jacks) Sensitivity 0.2 mV (–72 dB) Accept low impedance microphones LINE INputs .....4 Sensitivity 0.06 V (–22 dB) Impedance 100 kΩ
Outputs	LINE OUTputs .....4 Output level 0.43 V (–5 dB) at load impedance of 100 kΩ with the PB LEVEL control in center click position (PB LEVEL control set to MAX: 0.775 V=0 dB) Suitable load impedance···higher than 10 kΩ HEADPHONE jacks .....2 Accept 8 Ω stereo headphones.
AC outlet:	Unswitched 1 (300 W maximum)
Dimensions:	17³/₈(w)×22(h)×8³/₄(d) inches
Weight:	58 lb 7 oz
Supplied accessories:	10½-inch reel.....1 Reel adaptor RAD-10 .....2 Connecting cord RK-74H.....4 Head cleaning ribbon.....1 4-channel demonstration tape .....1 AC power cord 1

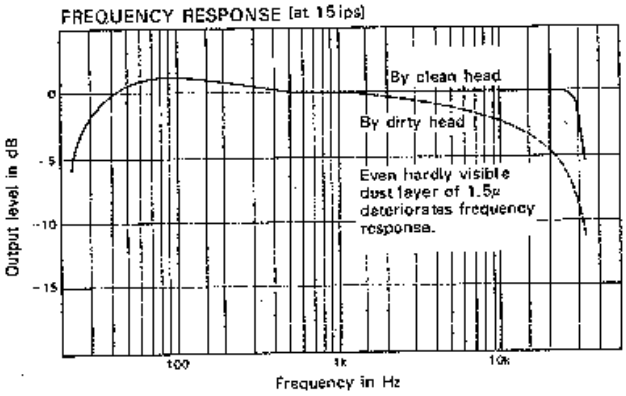
Design and specifications subject to change without notice.

FREQUENT CLEANING OF HEADS RECOMMENDED

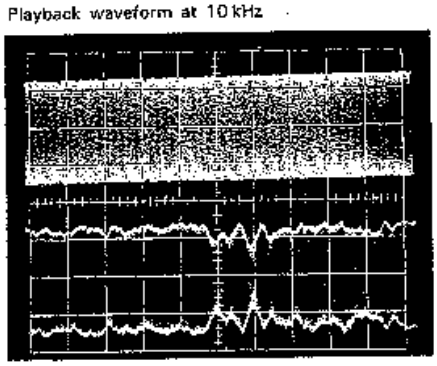
- The best performance of your TC-788-4 depends on your periodic cleaning of the heads and all surfaces over which the tape travels. Cleaning should be done after every 10 hours of operation. For details refer to the "MAINTENANCE" section on page 20.

Clean head

Dirty head



Playback waveform at 10 kHz



By clean head

By dirty head

The output level fluctuates

If you have any problem with your recorder, consult your nearest Superscope Service Station.

PRECAUTIONS

Safety

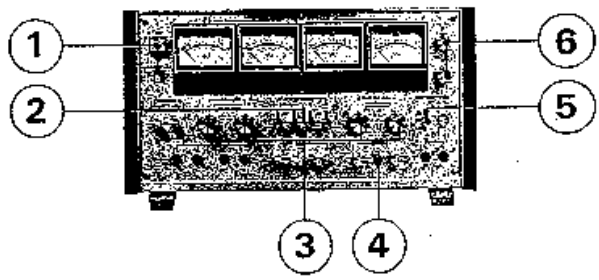
- Operate only on 120 V AC, 60 Hz.
- Should any liquid or solid object fall into the mechanism, unplug the set and have it checked by qualified personnel before operating it any further.
- Unplug the set from the wall outlet when it is not to be used for an extended period of time.
- To disconnect the cord, pull it out by the plug. Never pull it by the cord.

Installation

- The TC-788-4 is designed for vertical operation only.
- Good air circulation is essential to prevent internal heat build-up. Be careful to select a position which allows adequate air circulation. Do not place the set in an enclosure—like shelf that would block the ventilation grilles at the back, top, or sides of the set. Never place anything on top of the cabinet.
- Do not install the set in a location near heat sources such as radiators and air ducts or in a place subject to direct sunlight, and protect it against excessive dust, mechanical vibration, and shock.

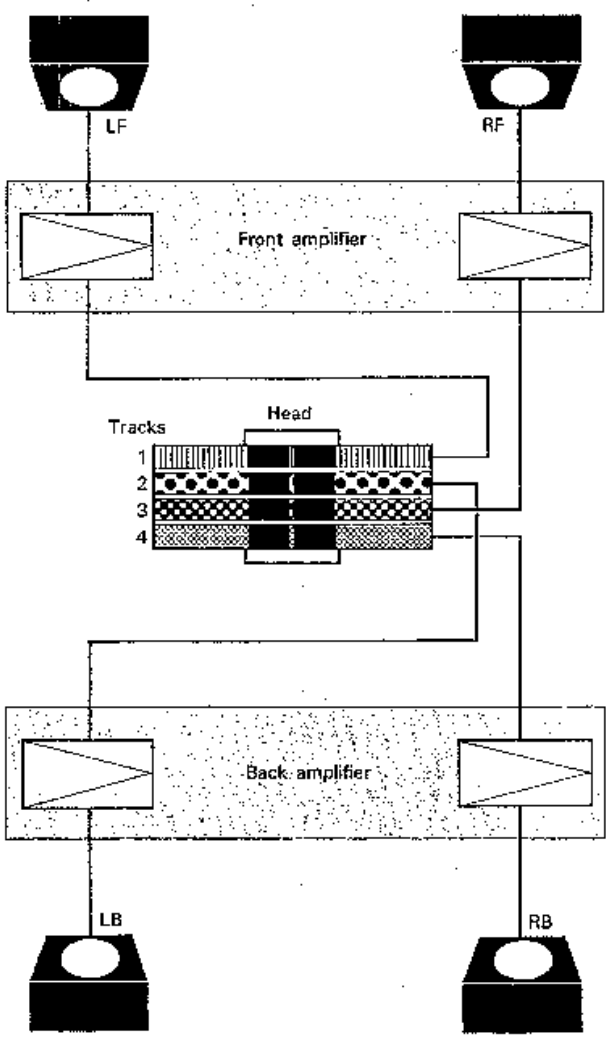
Operation

- Lock the reels before operating.
- Thread the tape without slack and set the tension arms in operating position.
- MIC and LINE sources can be used simultaneously for mixing, but if you want to record only one of them, turn the level control of the undesired input fully counterclockwise.
- The following controls are special features. So keep them in their normal positions until otherwise stated, and check them from time to time to prevent operation errors:
  - ① During normal use keep the REC TIMER LOCK lever in the upper position. This lever should never be used except for timer-activated automatic recording.
  - ② Be careful not to move the REC MODE switches while recording.
  - ③ Keep the MIC ATT switches OFF (pushed-in position of the MIC REC LEVEL controls).
  - ④ Be sure to turn the PAN POT switch to OFF, if this feature is not wanted.
  - ⑤ Keep the HEADPHONE switch in the 4 CH (2 CH) position.
  - ⑥ Keep the PB LEVEL controls in the center position.



QUADRAPHONIC SOUND

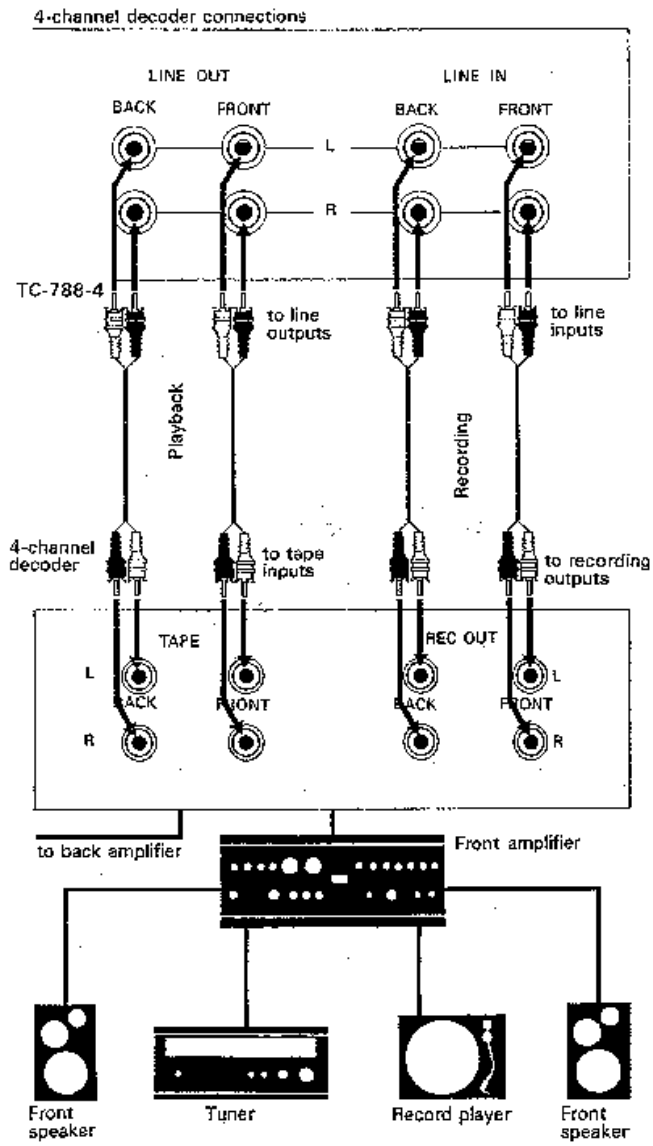
Quadraphonic sound permits the accurate reproduction of music as it is heard in a concert hall and gives you the feeling of being immersed and surrounded by sound. 2-channel systems, even in an acoustically ideal living room, cannot reproduce the ambiance and radiation of a good auditorium because of their difference in room size and the limitation of the sound source to two dimensions. Quadraphonic systems open the third dimension by adding two channels to the existing two front channels providing the separately recorded, reflected sound of a large hall, and thus create the special characteristics and ambiance pattern of a fine concert hall in your living room.
Furthermore, for popular music, quadraphonic systems permit instruments to be located to the back and sides of the listener, creating the illusion of being in the center of the musicians, and thus open the possibilities to a large number of surprising effects.

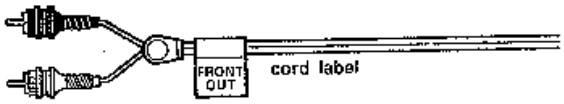


CONNECTIONS

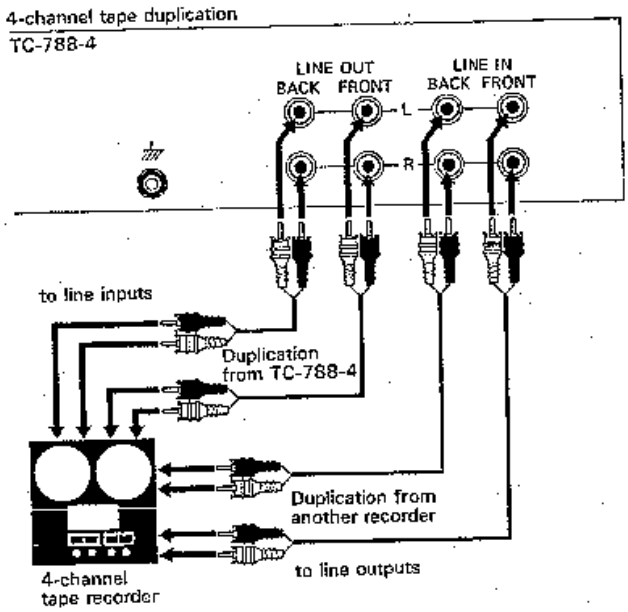
While making connections, observe the following notes:
- Turn off the amplifier while making connections.
- Insert the cable connectors completely into the jacks. Loose connections may cause hum and noise.
- For high quality recording use the supplied connecting cords; use the red plugs for the right-channel connections and the remaining plugs for the left-channel connections.
- Attach the supplied cord labels to each cord as this simplifies later checks.

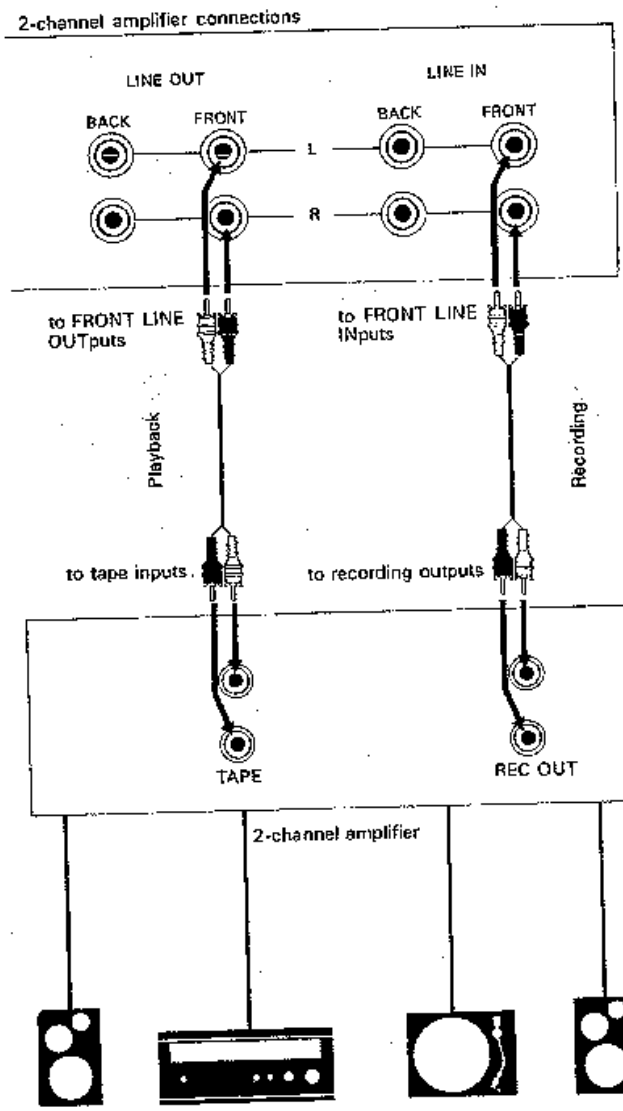
Amplifier connection
For playback connect the recorder LINE OUTputs to the amplifier tape inputs (or discrete or auxiliary inputs). For recording connect the recorder LINE INputs to the amplifier recording outputs. For conventional stereophonic recording or playback only the front channel connections are needed.

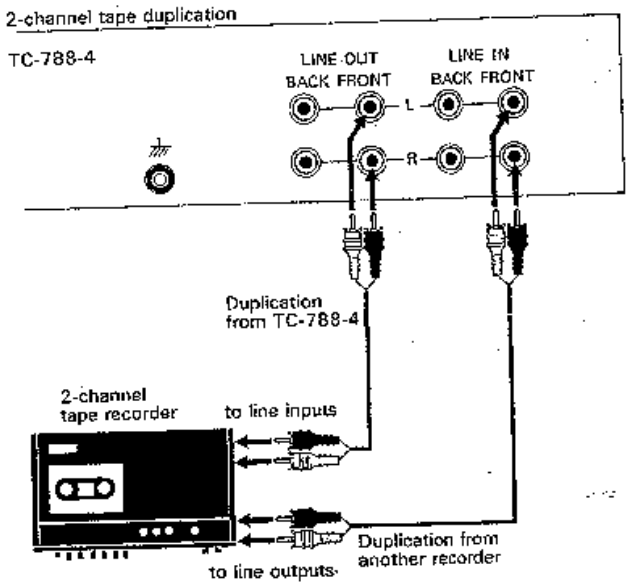




Tape duplication connection







Power connections

Connect the AC INput to a wall outlet of 120 V AC by using the supplied AC power cord.

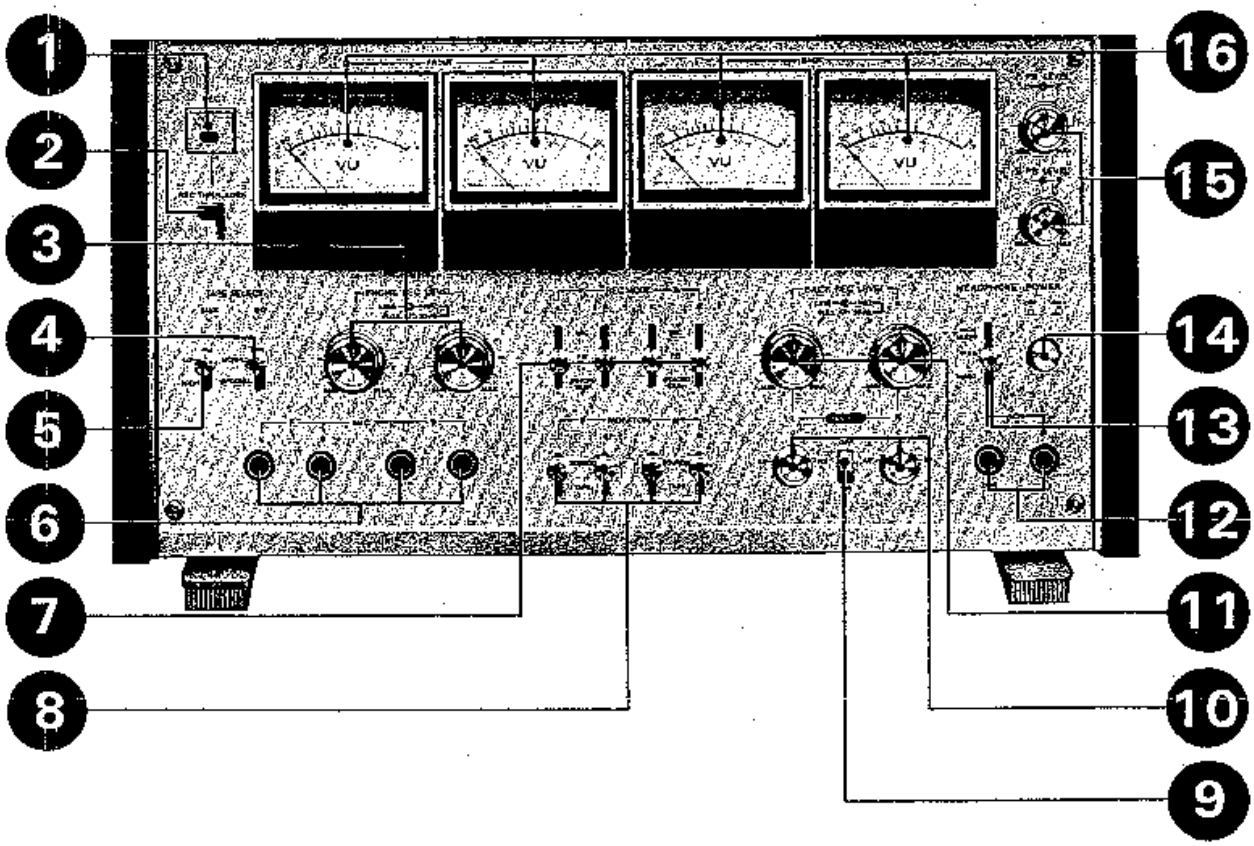
The AC OUTLET is designed to supply AC power (maximum 300 watts) to other components such as a turntable, etc. This outlet is not controlled by the front panel POWER switch.

Ground connection

If hum occurs, it may be helpful to connect the ground terminal [⏚] to an appropriate external ground.

FUNCTION AND LOCATION OF PARTS AND CONTROLS

Amplifier section



❶ RECord button
For recording, fully depress this button, and while holding it depressed push the ▶ button. The red lamp in the button will light indicating that the recorder is in record mode.

❷ REC TIMER LOCK lever
During normal operation this lever should be in the upper position. For timer-activated recording slide it down after pushing the REC button, and the TC-788-4 will record (and erase) any time the ▶ button is pushed.

❸ FRONT REC LEVEL controls
The left controls are for the left front channel, and the right for the right front channel. The larger knobs adjust the recording level of the corresponding LINE INputs, and the smaller ones adjust the level of the MIC inputs. Excessively high microphone input signals may be attenuated by pulling the MIC controls outwards [PULL ATT 20 dB]. Normally, however, they should be kept pushed inwards.

❹ Equalization selector [EQ]
Select the best equalization characteristics for the tape used, in both record and playback modes. Recommended EQ settings for representative tapes are listed on page 10.

❺ BIAS selector
For recording, select the best bias current for the tape used. Recommended bias settings are listed on page 10.

❻ MIC jacks
Any high quality low-impedance microphone equipped with a phone plug may be used. For quadraphonic recording use the appropriate front and back inputs.
For stereo recording with more than 2 microphones use the front inputs for the extreme right and left positions, and the back inputs for the positions in between or the reflected sound, while switching the PAN POT switch on (refer to "Mixing with the Use of the Panoramic Potentiometer [PAN POT]" on page 16).

❼ REC MODE switches
Select the tracks to be recorded by setting these switches to REC. Red lamps in the corresponding VU-meters will illuminate indicating that the channel is ready for recording. For playback set the switches to the PB position. For synchro-track recording set the switch(es) of the prerecorded track(s) to SYNCRO TRAK, and those of the tracks to be recorded to REC.

❽ MONITOR switches
For playback set these selectors to TAPE, and for record level adjustment set them to SOURCE. While recording, tape monitoring is possible at TAPE, and source monitoring at SOURCE.

❾ Panoramic potentiometer switch [PAN POT]
During normal operation this switch should be set to OFF.
Set this switch ON to feed back-channel input signals to the front channels. The green PAN POT lamp will light to remind you that the panoramic potentiometers are activated

❿ Panoramic potentiometer controls [PAN POT]
To feed the input signals of one of the back channels to the left front channel, turn the corresponding PAN POT control to LF. To convey these signals to the right front channel, set the control to RF. The center click position, marked C, directs the added sound source to the center front position. These controls allow the acoustical positioning of one or two mono sound sources between the left and right front channel positions.

⓫ BACK REC LEVEL controls
They function in exactly the same manner as the FRONT REC LEVEL controls to regulate the back channel record volume.

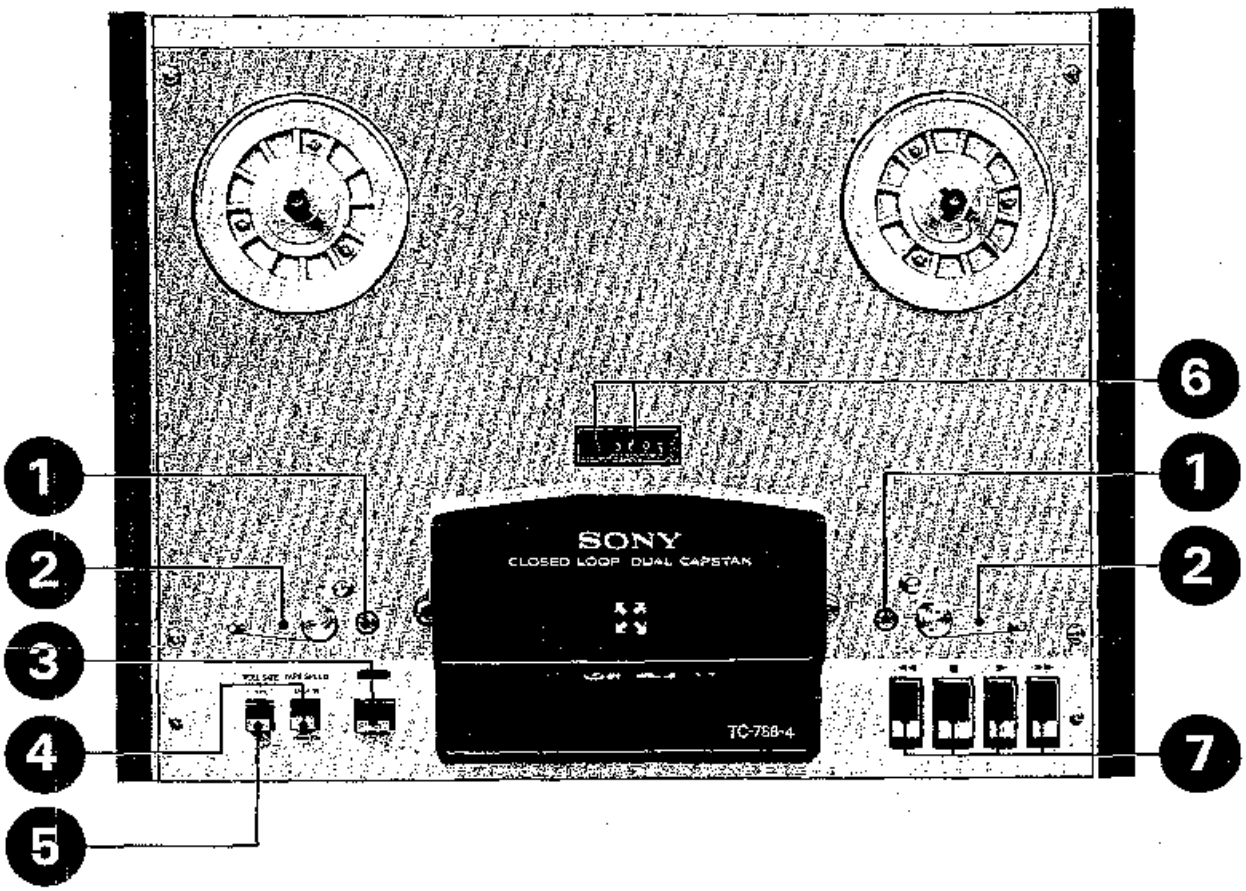
⓬ HEADPHONE outputs and
⓭ HEADPHONE switch
Any high quality 8-ohm stereo headphones (two or four channels) equipped with a standard binaural phone plug can be connected. With the HEADPHONE switch set to 4 CH (2 CH), the Front headphone output provides the front channel (LF and RF) sounds or the left and right sounds in stereo recording or playback, while the Back headphone output provides the back channel sound (LB and RB) in quadraphonic recording or playback.
In the F+B position of the headphone switch the front and back sounds of the left channels can be heard mixed in the left headphone, and those composed of the front and back right channels in the right headphone, independent of whether the connection is made to the front or back headphone output.
When the headphone switch is set to MONO, the sounds of all four tracks are mixed together and can be heard on either channel, right or left, front or back.

⓮ POWER switch

⓯ Playback level controls (F PB LEVEL and B PB LEVEL)
These knobs adjust the playback signal level at the LINE OUT and the HEADPHONE jack, which are also shown on the VU-meters when the monitor switch is set to TAPE. A 0-VU reading corresponds to an output voltage of 0.43 V. During normal use set the smaller knob (R channel) to the center click position and align the larger knob with the other one. If the level is too high or too low, adjust these knobs: full clockwise rotation will provide 5 dB boost, and full counterclockwise rotation will mute the sound.

⓰ VU-meters
With the monitor selectors set to SOURCE, the meters show the recording level, with the selectors set to TAPE, the meters show the output level at the LINE OUT and HEADPHONE jacks; 0-VU reading corresponds to 0.43 volt.

Tape-transport section



❶ Tape-height adjusters
If the tape rubs a reel edge, the tape height can be slightly adjusted with these screws; clockwise rotation will bring the tape closer to the front reel edge, and counterclockwise rotation closer to the rear edge. Before adjusting check both supply and take-up reels. If they are warped, replace them.

❷ Tension arms
If both arms are horizontal, the tape-transport control circuit prevents any tape motion.

❸ PAUSE lever
For instant stop depress the lever in record or playback mode (The PAUSE lamp will light). A slight push upwards releases the lever again.

❹ TAPE SPEED selector
For critical recordings, when extended frequency response and dynamic range are required, 15 ips (38 cm/s) is recommended. 7½ ips (19 cm/s) will still yield excellent sound quality while saving tape.

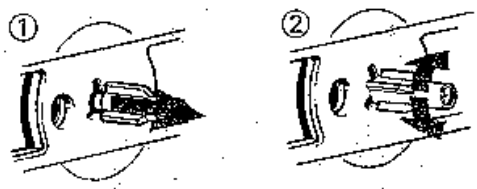
❺ REEL SIZE selector
Select the optimum rewind tension and reel torque for the reels used: The 10½ position is for 10½-inch (270 mm) reels, and 7 is for 7-inch (180 mm) or 5-inch (130 mm) reels. Use the same kind of reel (size and hub diameter) for both supply and take-up side.

❻ Tape counter

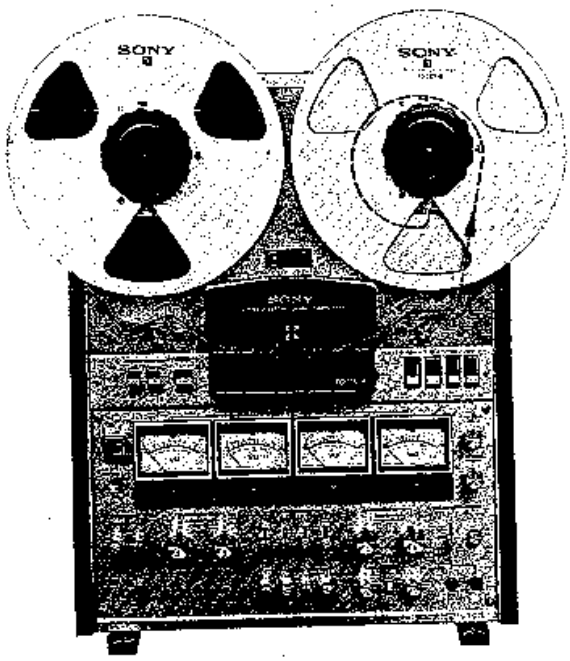
❼ Function buttons
◀◀ rewind, ■ stop, ▶ forward, and ▶▶ fast forward; these buttons can be depressed at random to change tape motion from normal to fast wind and vice versa.

APE THREADING

se the same kind of reels (size and hub diameter) for both supply
id take-up.
. Place an empty reel on the take-up (right) side and a full reel on the supply (left) side.
. Lock the reels as illustrated.



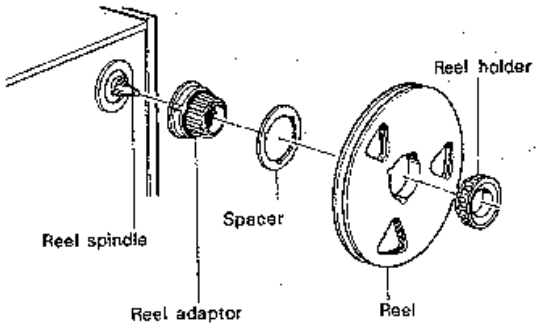
., Thread the tape as illustrated. Be sure to pass the tape under the tension arm guides, and above the fixed tape guides.



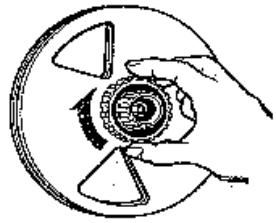
4. Rotate the reels to take up tape slack until the tension arms are in their lifted (operating) position.

- For the 10½-inch reel supplied neither reel adaptor nor spacer is required.
- Use the supplied reel adaptors RAD-10 as illustrated to install 10½-inch (270 mm) metal reels.

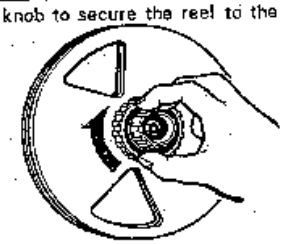
Note: Do not use the spacers for 10½-inch plastic reels.



Turn the outer knob to secure the reel to the adaptor.



Turn the inner knob to secure the reel to the spindle.



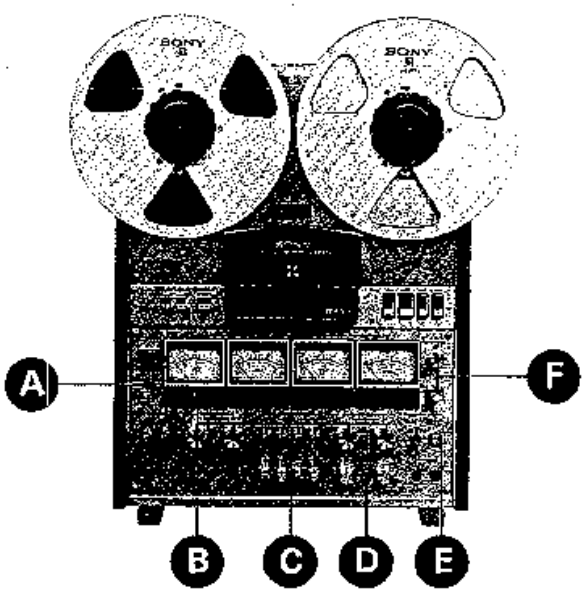
Note: When threading a tape make sure that the function buttons ◀◀, ▶, and ▶▶ are released (Press the ■ button). If any of these buttons is depressed and power is on, the tape motion will start as soon as one of the tension arms is moved into operating position.

RECORDING AND PLAYBACK

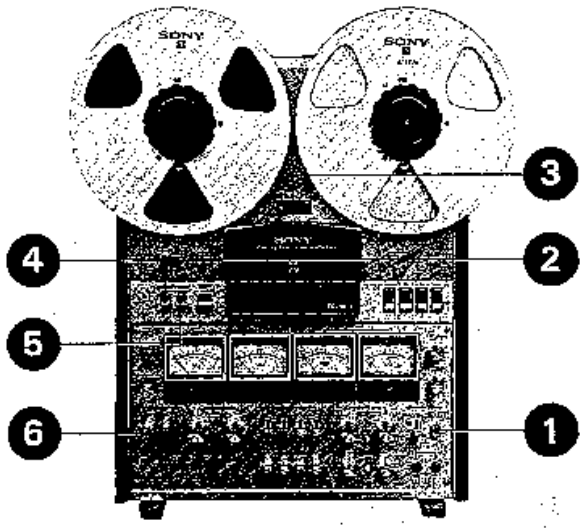
The following six control setting should be checked before any recording and playback to prevent operating errors or undesired effects. The function of each switch is explained on page 7. and 8.

During normal operation (record as well as playback) keep the six controls in the following positions:

- Ⓐ REC TIMER LOCK lever .....unlocking (upper) position.
- Ⓑ MICrophone ATTenuators ....OFF (pushed-in position of each MIC LEVEL control).
- Ⓒ REC MODE switches.....Only for those channels to be recorded: REC; for the other channels or during playback: PB.
- Ⓓ PAN POT switch .....OFF.
- Ⓔ HEADPHONE switch .....4 CH (2 CH).
- Ⓕ Playback level controls .....Center position for the channels (F and B PB LEVEL) to be used and fully counter-clockwise position for the channels not to be used.



Fundamental Steps



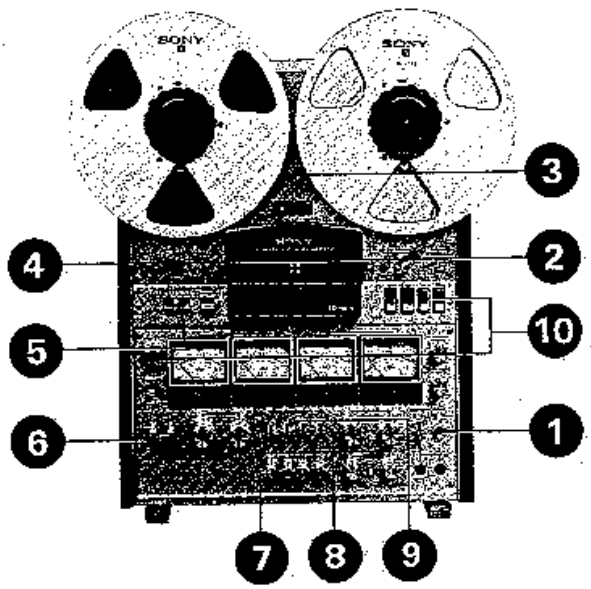
1. Turn the POWER switch on.
2. Thread a tape. Make sure that the tension arms are in operating position.
3. Set the tape counter "0000" by depressing the reset button.
4. Switch the REEL SIZE selector to the appropriate position.
5. Set the TAPE SPEED selector as desired.
6. Set the BIAS and EQ selectors according to the tape used:

BIAS selector	EQ selector	Tapes
LOW	NORMAL	**SONY SUPER 150, SUPER A** TDK 150 SCOTCH 150 Other 150-type tapes
LOW	SPECIAL	**SONY SLH** MAXELL LNE 35 AGFA PE 35 BASF LP 35, 35 LH
HIGH	NORMAL	SCOTCH 203, 206 TDK SD 150

For recording select proper setting of BIAS and EQ switches. For playback select EQ proper setting.

The above six fundamental steps are common to any operation. For the next steps proceed to one of the following paragraphs, whichever is appropriate: 4-Channel Recording, 2-Channel Recording, Playback (4 CH, 2 CH), or Mono Recording and Playback.

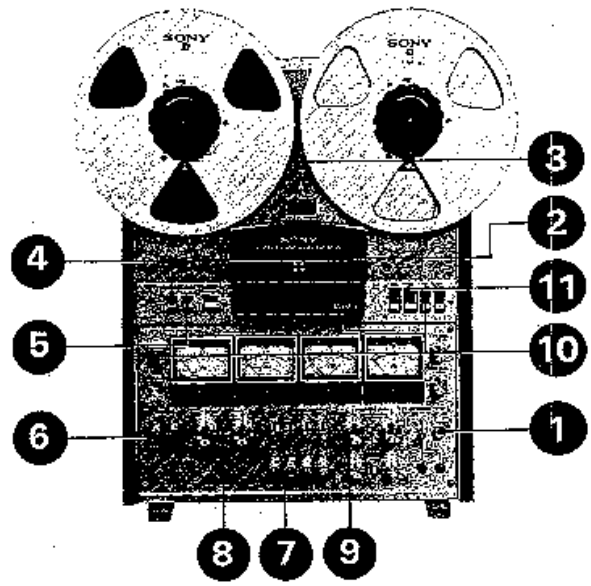
4-Channel Recording



The input jacks (MIC, LINE IN, or both) and REC LEVEL controls of all four channels are used. Perform the fundamental steps ❶ to ❻ and continue with the following steps ❼ to ⓯.

❼ Set all four MONITOR switches to SOURCE.
❽ Adjust all four record levels at their respective controls. For a correct record level setting refer to chapter "RECORD LEVEL ADJUSTMENT" on page 14.
❾ Set all four REC MODE switches to REC. The red lamps in the VU-meters will light to indicate that the recorder is ready for 4-channel recording.
⓯ While fully depressing the REC button, push the ▶ button. The recording will start. As the four tracks corresponding to the four channels cover the full width of the tape, you cannot record on the reverse side of the tape. So you have to rewind the tape at the end of the recording.

2-Channel Recording

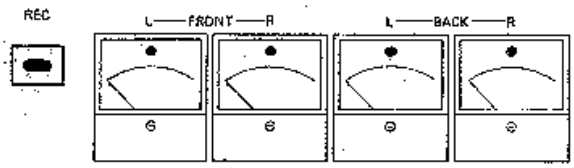


For conventional 2-channel stereo recording only the front inputs and controls are used. After having performed the fundamental steps ❶ to ❻, proceed with steps ❼ to ⓫.

❼ Set the Front MONITOR switches to SOURCE.
❽ Adjust the FRONT REC LEVEL controls. For a correct record level setting refer to paragraph "RECORD LEVEL ADJUSTMENT" on page 14.
❾ Set the Front REC MODE switches to REC. The red lamps in the FRONT VU-meters will light indicating that the recorder is ready for 2-channel recording. Leave the REC MODE switches of the back channels in PB position.
⓫ While fully depressing the REC button (The red lamp in the button will light.), push the forward-button ▶ to start the 2-channel recording. Now the recording is made on track 1 and track 3.
❿ For recording on the remaining two tracks, depress the ■ button at the end of the tape, reverse the reels and repeat step 10.

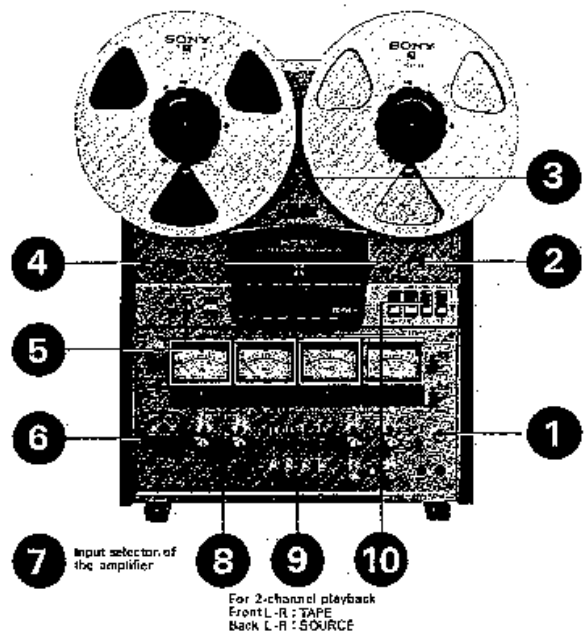
Notes on Recording:

- After having done a recording with the REC TIMER LOCK lever pulled down, don't forget to release it as soon as possible.
- Turn all REC LEVEL controls not in use fully counterclockwise to improve the S/N ratio.
- Only when the red lamp in the REC button and those in the VU-meters are lit together, will the channels indicated by the VU-meter lamps be recording.



- Set only the REC MODE switches of the channels used to REC, and keep the others in the PB position.
- Be careful not to move the REC MODE switches while recording.
- If the TC-788-4 outputs are connected to amplifier inputs which are not controlled by a monitor switch, do not set the amplifier input selector to this input while recording. Otherwise oscillation may occur since the recorder output signals return to its inputs through the amplifier. If this happens, reduce the PB LEVEL control until you have changed the amplifier input-selector setting to another position.
- If you re-record on a previously recorded tape, either erase the tape fully (see page 13), or use only the PAUSE button to control the tape motion, because a tiny portion of the previously recorded sound will not be erased when the stop- and start-functions are used.
- As a rule, the PB LEVEL controls should be in center position while recording. This position will prevent failure when accidentally adjusting the record level with the MONITOR switches set to TAPE. If this should happen with the PB LEVEL controls at MAX, the record level will be too low and thus the S/N-ratio will deteriorate, and with the controls set to too low, the distortion figure will be very high because of oversaturation of the tape.

Playback (4 CH, 2 CH)



For 4-channel playback, front and back output jacks and level controls are used, whereas for 2-channel playback only the front jacks and controls are needed. Continue the six fundamental steps (on page 10) with the following four steps:

❼ Set the amplifier input selector to the position where the TC-788-4 is connected.
❽ Set all four REC MODE switches to PB.
❾ For 4-channel playback move all four MONITOR switches to TAPE.
For 2-channel playback set only the front switches to TAPE and leave the back switches in the SOURCE position.
❿ Push the ▶ button, and the playback will start.
In case of conventional 2-channel playback, reverse the reels at the end of tape and push the ▶ button once more.

Notes on Playback:

- Playback is possible with the REC MODE switches in the SYNCRO TRAK positions. But as in this case the playback signal is amplified by the synchro track amplifier, the sound quality will deteriorate.
- Tapes recorded with too high or too low a record level can be played back on the TC-788-4 by adjusting the PB LEVEL controls.
- If SLH- or other low noise tape is played back with the EQ selector in NORMAL position, the output will be increased by about 2.5 dB. On the other hand, with a normal tape and in the SPECIAL setting, the output will be too low by the same amount (2.5 dB). This is the only effect of the EQ selector during playback.
- If you have made 4-channel connections, but want to do 2-channel playback, turn the Back PB LEVEL controls fully counterclockwise.

Mono Recording and Playback

Mono recording and playback procedures are essentially identical with those for stereo except for the channels used. But attention must be paid to the following points.
In case of recording all tracks in succession:

- Only the LF and RF jacks and controls are used, one after the other (Refer to the following chart).
- At the end of each track, do not rewind the tape but reverse the reel positions.

	Record			Playback		
Track sequence	Input connection	REC MODE switch	MIC or LINE IN REC LEVEL control	Output connection	MONITOR switch	PB LEVEL control
Track 1 / Track 4	LEFT FRONT input jack	LF to REC, all others to PB	Left FRONT	LEFT FRONT output	LF to TAPE, all others to SOURCE	LF PB LEVEL control. Turn all others fully counterclockwise.
Track 3 / Track 2	RIGHT FRONT input jack	RF to REC, all others to PB	Right FRONT	RIGHT FRONT output	RF to TAPE, all others to SOURCE	RF PB LEVEL control. Turn all others fully counterclockwise.

The safest method to distinguish between the two ends of a tape (and thus between track 1 and 4, or 2 and 3, respectively) is to make notes of the color of the outer leader tape together with the notes concerning the contents. If you use a tape brand where the numbers 1 or 2 are printed on each reel side, you may use these numbers as well, but in this case you must be very careful never to let the take-up reel show a different number from the supply reel.

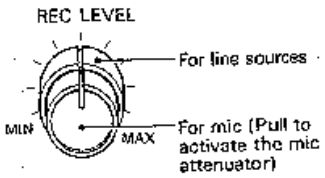
Erasing Tape

1. Thread the tape which is to be erased.
2. Turn all MIC and LINE REC LEVEL controls fully counterclockwise, or disconnect all inputs, or switch all signal sources off and disconnect the microphones only.
3. Set all four REC MODE switches to REC.
4. With the REC button depressed, push the ▶ button. Now the tape is being erased completely (full track). The tape speed of 15 ips is recommended.

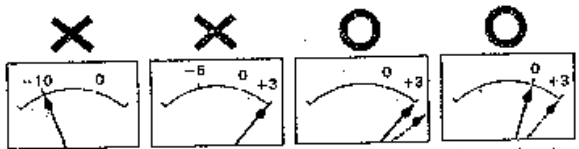
- For quick erasure, use a bulk eraser.

RECORD LEVEL ADJUSTMENT

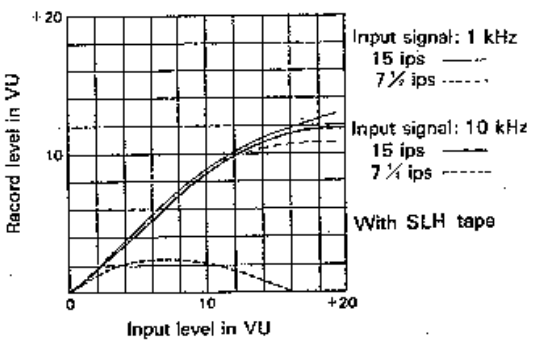
If your sound source is an FM-broadcast or a record, the larger controls have to be used for adjustment of the record level, and the smaller controls for microphone recordings.
Please don't forget to turn all level controls not in use to MIN in order to achieve the best S/N-ratio possible.



Adjust the record levels of each channel while watching the needle of the corresponding VU-meter and listening to the loudest passage of the program you want to record. When recording at 7½ ips, avoid swinging of the needles into the red zones (0—+3 VU) because this will lead to distortion. On the other hand the levels should be as close as possible to 0 VU to make full use of the large dynamic range. Otherwise tape hiss will be considerably increased during playback. When using the 15-ips speed, staying of the needles within red zone is still tolerable, as the dynamic range becomes wider than that of 7½ ips.



Too low level setting (S/N ratio will be poor.) | Too high level setting (Sound will be distorted.) | Proper level (at 15 ips) | Proper level (at 7½ ips)

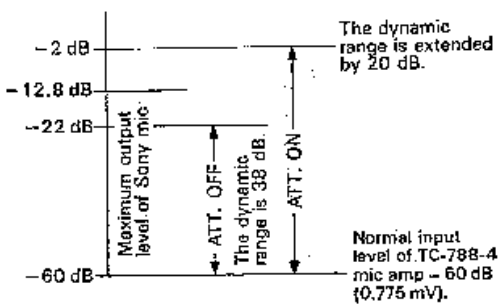


But be cautious with peaks of short duration out of a relatively low record level; as the needles of the VU-meters cannot follow them because of their inertia, they will show levels much smaller than the actual levels (up to 12 or 14 dB). In case of extreme short pulses your ears might as well be unable to recognize distortion, so you should not worry too much.

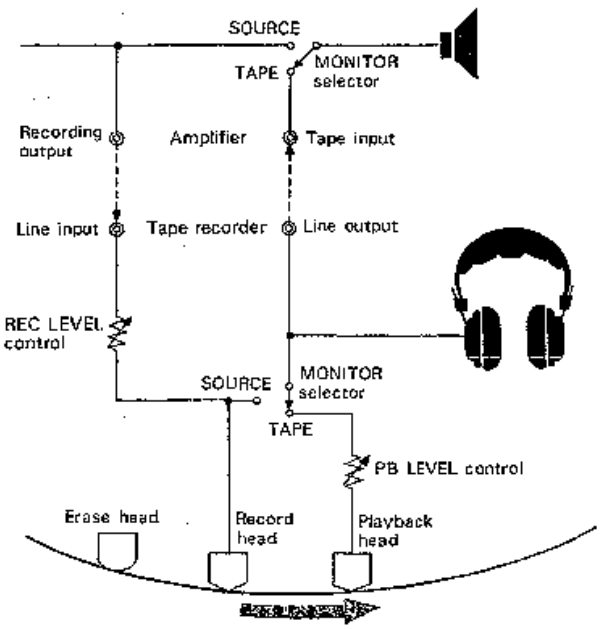
Recording of FM broadcasts or records is relatively simple because broadcast stations and record companies use standardized limiters to reduce the dynamic range of the original sound source.
With hardly any exceptions their program has been recorded on tape at least once in a previous stage. You can record with a fixed level once you have established the proper LINE REC LEVEL settings, one matching the output level of your cartridge and the other one matching the output level of your tuner or receiver. Usually there is a fixed relation between the time signal strength and full modulation of a given FM station, in most cases the time signal being 2 or 3 dB lower. Once you know their relation at your favorite station this will provide a good mark for the REC LEVEL control settings.

A little more care has to be taken in case of live recordings. The dynamic range is undiminished by any limiter, and a small movement may change the distance between sound source and microphone, thus changing the signal level even when repeating an identical passage. Above all consideration has to be given to the fact that tape saturation and distortion at higher frequencies occur at lower levels, which may be especially troublesome in case of piano recordings etc. To make things even more complicated, there is the danger of overloading the microphone amplifiers.
But having acquired a little bit of experience, you will be quite successful when paying attention to the following points.

1. Allow some more headroom by setting the level of the largest input signals to −3 or −5 VU.
2. As in contrast to the line inputs the microphone record level is adjusted behind the microphone amplifiers, use the MICrophone ATTenuator switch to avoid turning the level controls too far counterclockwise and overloading the amplifiers, when large input signals like bass or drum sounds are expected. By pulling the MIC REC LEVEL knobs outwards the input signals will be attenuated by 20 dB before they reach the microphone amplifiers. Overload distortion will be avoided by this (in fact a safety margin of approx. 13 dB remains above the highest output level of all Sony microphones), and the setting of the level can be done more easily, because the controls are adjusted around the center position.


−2 dB
−12.8 dB
−22 dB
−60 dB
The dynamic range is extended by 20 dB.
Maximum output level of Sony mic
ATT. OFF
The dynamic range is 38 dB.
ATT. ON
Normal input level of TC-788-4 mic amp – 60 dB (0.775 mV).

Anyway, whether you are recording line or microphone sources, the safest method to avoid any failure is to listen with a pair of good headphones to the results of your recording (MONITOR switches set to TAPE). By comparing the recorded sound with the original (SOURCE) you will easily detect any distortion and can reduce the record level accordingly. Furthermore, this comparison will warn you against dirty heads (loss of high frequencies) and dirty or faulty tapes (drop outs).



For line stereo recordings it will usually be best to adjust the record level of the channel with the larger signals first and to move the control of the second channel into the same position, so that a mono signal seems to come from the center. Any unbalances thereafter will be deliberately caused by the record company or FM-station. In case of microphone recordings balance the channels to produce the desired impression.

For quadraphonic 4-channel recordings this question cannot be answered generally, as too much depends on your intentions. But in most cases it will be best to set the record level of each channel separately for optimum dynamic range. If you use the back channels only for ambient sounds, you will have to reduce for reproduction the Back channel PB LEVEL, or change the front/back-balance control of your amplifier, or use both together, until a normal sound is achieved.

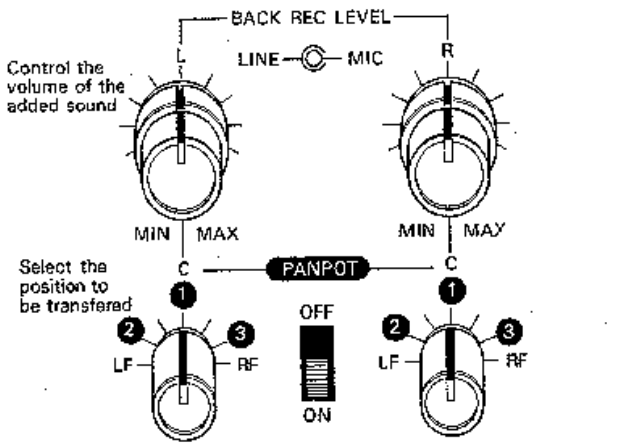
Do not change the record level once the recording has started, as this will easily be audible during playback, especially, when the stereo balance is changed. If adjustment becomes necessary after the beginning of the recording, it will be advisable to wait until a break or a pause between movements occurs or a soloist has finished his turn.

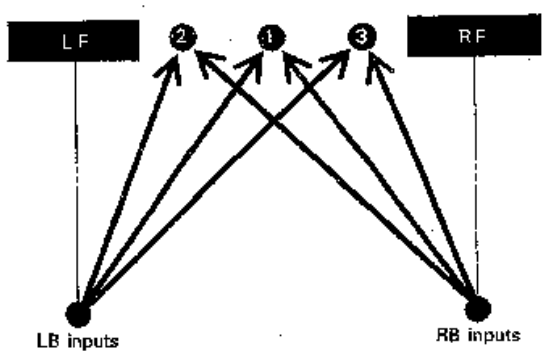
SPECIAL OPERATIONS

Microphone and Line Mixing
The TC-788-4 provides a MIC-and-LINE mixing facility for each channel.

1. Connect the program sources to be mixed to the corresponding MIC or LINE INputs. The mic- and line-inputs belonging to one channel can now be mixed.
2. Set the MONITOR switches to SOURCE.
3. Adjust the desired mixing levels while monitoring through headphones. The VU-meters indicate the composite recording level of line- and mic-inputs.
4. Start the recording as explained in chapter "4-Channel Recording" on page 11.

Mixing with the Use of the Panoramic Potentiometer (PAN POT)
The PAN POT was designed to utilize the otherwise idle back channel amplifiers for normal 2-channel stereo recordings in the most versatile manner. As a result, up to two MIC and two LINE INputs can be mixed onto each front channel at the same time, or up to three MIC and three LINE INputs onto one front channel.
The PAN POT is especially useful when the separate recording of each instrument of a jazz or rock group is required, or for making balanced recording with the microphones in cases that usually cannot be balanced, or when recording one or two soloists against the stereo background of an ensemble or orchestra. In any case the PAN POT exactly defines the position of sound sources between the stereophonic left and right.





How to use the PAN POT:

1. Connect the signal sources whose acoustical position you want to change to the LB or RB MIC or LINE INputs. The LF and RF input-positions cannot be influenced.
2. Insert headphones to the Front 2 CH HEADPHONE jack and set the HEADPHONE switch to 4 CH (2 CH).
3. Move all four MONITOR switches to SOURCE.
4. Adjust the front channel record level with the Front REC LEVEL controls.
5. Set the PAN POT switch to ON. The green PAN POT lamp will light to indicate that the panoramic potentiometers are activated.
6. While listening through headphones regulate the strength of the added signals at the Back REC LEVEL controls, and their position between left and right at the PAN POT controls. This can be carried out separately for each back channel. Turning of one of the PAN POT controls fully to the LF-position feeds the signal of the respective channel to the left front channel only, turning to RF to the right front channel only. At C the signal is distributed evenly between LF and RF. In between all other mixing positions can be taken up continuously.

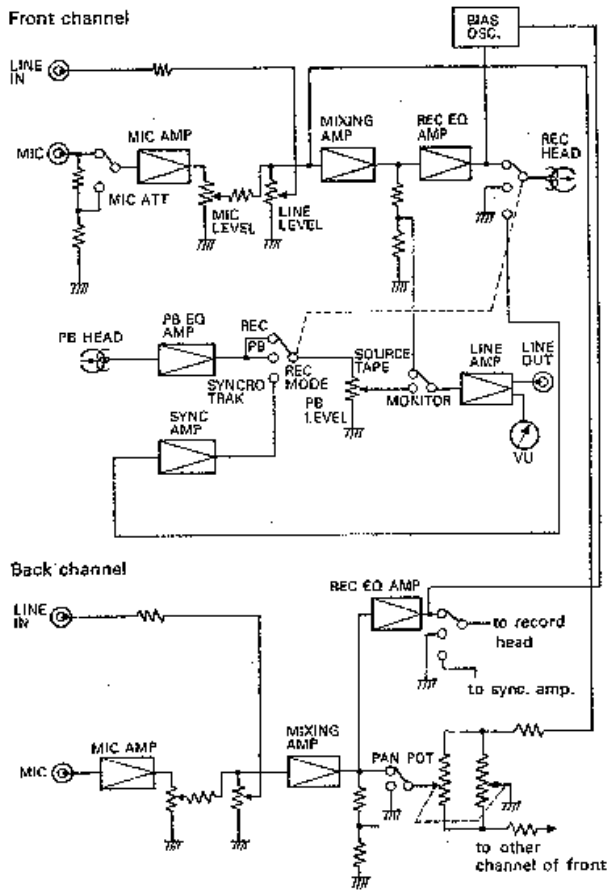
- If very high input signals should occur during live recording with microphones, the MIC ATTenuator of each channel can be used separately to prevent overload distortion of the mic amplifiers.
- The back VU-meters show the signal strength of the back channels only, whereas the front VU-meters show the strength of the composite signals, i.e. the actual recording level.

Synchro-Track Recording

"Synchro-track" describes the possibility of switching the record head on a certain track from record to playback by simply moving the REC MODE switches. Thus it becomes possible to use the record head simultaneously for the playback of one or more previously recorded tracks and for the new recording on one or more of the remaining tracks. As there is no time lag between recording and playback, this allows precise timing for the newly added materials and opens many possibilities for tape editing.
The recording can be started on any channel.

1. Record the basic program (in the following called program A) on one or more of the four channels.
2. Rewind the tape to the beginning of program A.
3. Set the REC MODE switches of the channels belonging to the previously recorded program A to SYNCRO TRAK and the respective MONITOR switches to TAPE.
4. Connect the source of the program now to be added (program B) to one (or more) of the unrecorded channels, and set the respective REC MODE switch(es) to REC and MONITOR switch(es) to SOURCE.
5. Set the REC MODE switches of the channels completely unused (neither for record nor for playback: LB and RB in the example given below) to PB and their MONITOR switches to SOURCE.
6. Use headphones and select a jack and HEADPHONE switch setting most appropriate to your intentions. (Most probably this will be F+B and any of the two jacks). If program B is not recorded through microphones, you may use speakers, too.
7. Depress the REC button firmly and push the ▶ button. Recording of the new material now begins. As by means of the SYNCRO-TRAK function of the REC MODE switch recording and playback occur via the same record head, programs A and B are on the identical tape portion (though on different tracks) and can thus be perfectly synchronized.
8. When repeating steps 2. to 7, you can still add another new program.

- As in the REC position of the REC MODE switches the erase heads eradicate all previously recorded material on the same track, be very careful when selecting the channels on which you want to record program B, and set only the switches of these channels to REC.
- If you are not yet satisfied with the results of your synchro-track recording, you can erase program B and add a new one by simply rewinding the tape and repeating step 7.



Programs	REC MODE	MONITOR	Head	Tracks
Ⓐ (LF input)	L R L R REC — PB	L R L R SOURCE	Record OFF	Ⓐ
Ⓑ (RF input)	L R L R SYNCRO TRAK REC — PB	L R L R TAPE — SOURCE	Sync playback OFF Record OFF	Ⓐ Ⓑ

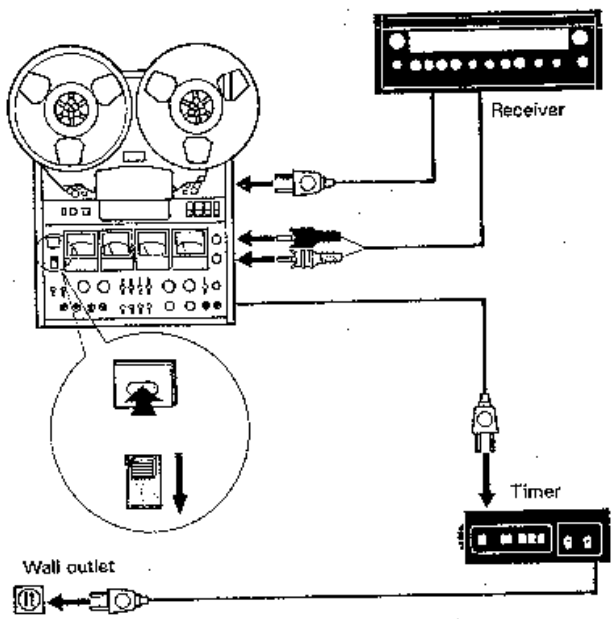
Timer-activated Recording

Automatic recordings may be made with a commercially available timer.

1. Select the desired FM station.
2. Thread a tape and adjust the recording level.
3. Switch the REC MODE switches of the desired channels to REC and leave the others in the PB position.
4. With the REC button depressed, move the REC TIMER LOCK lever down.
5. Connect the TC-788-4 power cord to the timer, and preset the desired time.
6. Push the POWER switch to ON, and depress the ▶ button. Now the TC-788-4 is ready to start an FM recording automatically.

   Note: Do not forget to release the REC button by moving the REC TIMER LOCK lever upwards after the end of the automatic recording.

For automatic playback, thread a tape, set all REC MODE switches to PB and all MONITOR switches to TAPE and perform steps 5 and 6.



About Tracks and Channels

The number of channels of a given music system (or part of it) is the number of completely separate, parallel signal paths covering the full audio frequency range that can be used at the same time. So a quadraphonic system with its front and back, left and right signals comprises four channels, and a stereo system with its separate left and right signals two channels.

The number of tracks describes the number of stripes of magnetized information across a tape that can be recorded and played back separately, regardless of their direction or whether the information is synchronous (quadraphonic, stereophonic) or completely a synchronous (different mono-programs). Of course the number of channels can never be larger than the number of tracks for a given tape deck.

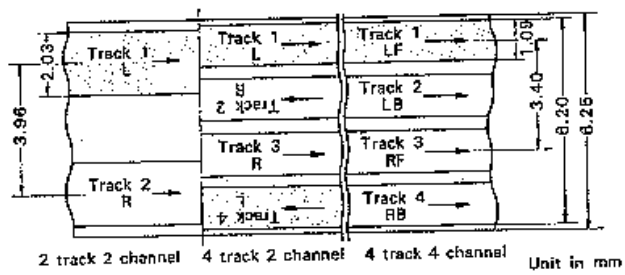
If you look at the record head of the TC-788-4, you will see four darker belts, the outer surfaces of the cores. When the tape passes these portions, it will be magnetized in tracks with exactly the same width as the belts. So you have recorded a 4-track 4-channel tape. As the whole width of the tape has been used, it cannot be reversed. Starting from the top, these tracks contain the channels LF, LB, RF and RB.

If every second belt is missing (or only they are used), but the remaining two are in the same position and have the same width, you can record only two tracks at a time in one direction (Track 1 for L and track 3 for R). But after having the tape reversed, the same dark belts of the heads touch the space previously left unrecorded. (Now track 4 is for L and track 2 for R.) As a result, you will have recorded four tracks, but because of the reversing process you can listen to only two tracks at one time, so it is a 4-track 2-channel tape.

When the record head has only two darker belts and these are wider than those of the TC-788-4 so that they cover the whole width of the tape, the tapes recorded by such heads are called 2-track 2-channel, and they can be played in one direction only. The upper track is for the left channel, and the lower for the right channel.

With a slight loss in S/N-ratio, 2-track 2-channel tapes can be played back on 4-channel tape decks with the deck in 4-channel playback mode and the amplifier in stereo (F+B) mode. On the other hand, quadraphonic 4-track tapes can be played on a 2-track stereo deck, but the sound will be unbalanced, as the left channel contains only part of the back information and the right channel only part of the front information.

4-track 2-channel and 2-track 2-channel tapes cannot be exchanged. (Even when using such tapes for new recordings, it is strongly advisable first to erase them completely on the deck on which they had been previously recorded, or with a bulk eraser.)



EDITING

There are two main ways of tape editing: editing by tape duplication and by splicing. (In some special cases synchro-track recording may be used as another form of editing.). Their major advantages and disadvantages are as follows:

Editing by duplicating

- Tapes recorded in two directions can be edited.
- Cassette programs can be included in the editing process.
- More creative results can be obtained by using the mic-and-line mixing facility.
- If the original programs are recorded in various levels, they should be copied to the same level by controlling the record level of the slave recorder (or the output level of the master recorder).

but

- Two recorders are required.
- Distortion and especially noise will be increased considerably while duplicating.

Editing by splicing

- As splicing does not increase noise or distortion, it is the most common technique used by professionals, but it requires quite some skill for noise-free splicing.
- Program switching can be done very accurately.

but

- Only tape recorded in one direction can be spliced.
- Mistakes can hardly be corrected.
- There is a lot of wasted tape.

According to your circumstances or preferred editing results, either way can be used or the two can be mixed. In either case experience will provide the required skill for noise-free and accurate editing results.

Before editing, play the original tape thoroughly, and note the Tape Counter number where the unwanted sounds (narration or commercials, pop noise, etc.) are located. Then go back and proceed with editing in either way.

Duplicating Procedure

1. Connect two recorders as shown on page 5.
2. Start the master recorder in playback mode and the slave recorder in record mode. At the unwanted portion, stop the slave recorder with the PAUSE lever until the unwanted passages have passed or you have changed the tape. The cueing facility on the master recorder will be very useful for precisely locating the start portion of the program.

Notes

- To stop the tape, the PAUSE lever should be used to prevent possible click noise.
- Best results are obtained when both recorders are of equal quality, but if one should be inferior, use the better one for the playback process.

Cueing Procedure for Splicing

1. Advance the tape to the counter number to be spliced, and stop the tape with the PAUSE lever in playback mode.
2. Move the tape across the playback head back and forth by turning both supply and take-up reels by hand.
3. While listening to cue sound, find the correct portion to be spliced, and carefully mark it at the position of the playback head on the outer side of the tape with a soft colored pencil. (Yellow will be most distinctive.)

Note: Take care not to get excess marking material on the heads. Any stains on the heads will cause contamination and impair good tape-to-head contact.

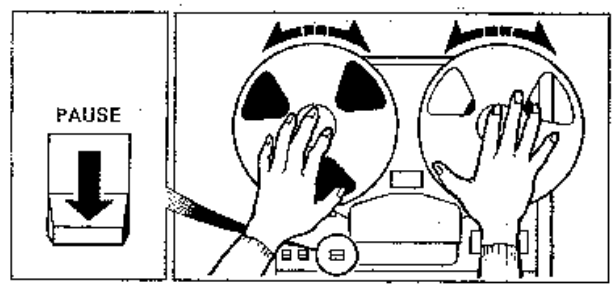
Splicing Tape

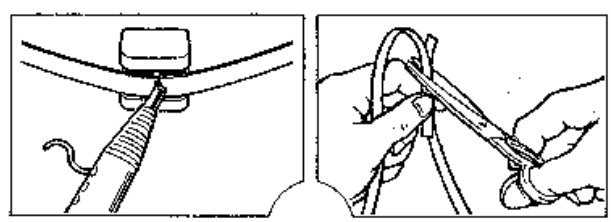
Use splicing tape and a demagnetized pair of scissors.

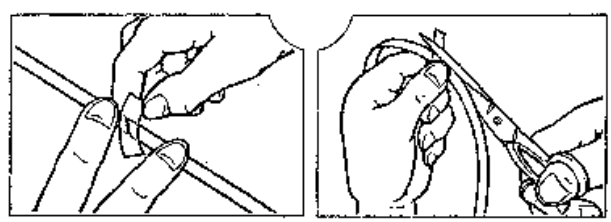
Note: Do not use ordinary cellophane tape as it tends to spoil recording tapes. Also avoid using magnetized scissors or razor blades. Magnetized instruments will cause a "click" or "pop" at the spliced portion.

Take care not to unnecessarily touch the portion of the tape to be spliced. Even invisible traces of grease and sweat from your fingers will hinder a good sticking.

1. Neatly overlap the tapes to be spliced and cut diagonally.
2. Place the two diagonal tape ends together, outer side up, on a flat surface. Be careful to make ends meet but not overlap.
3. Apply a piece of splicing tape diagonally over the aligned ends, and press it firmly.
4. Trim off the excess splicing tape, slightly cutting into the tape.







MAINTENANCE

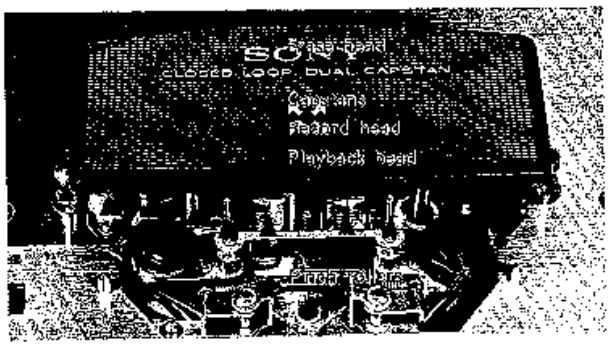
Cleaning Heads and Tape Path
Generally, cleaning heads after every 10 hours of operation will be sufficient. However, all surfaces over which tape travels should be cleaned before making high quality recordings.
Dirty heads and tape path will cause:

- Loss of high frequency response which results in poor sound quality.
- Loss of sound volume in recording and playback.
- Dropouts.
- Increase of wow and flutter.
- Unsatisfactory results in tape erasing.

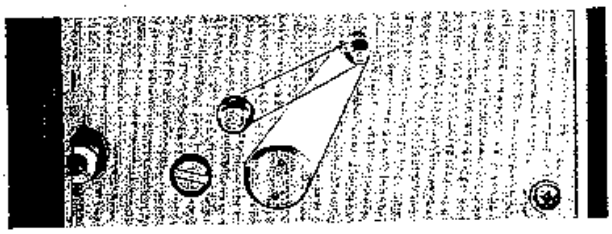
For better access to the heads pull off the lower part of the head cover. The upper part is better left in place, because it protects the fixations for the critical head alignment.

Take the supplied head cleaning aid (either ribbon or a tip) and wipe the heads and tape path. If the deposits are difficult to remove, moisten the ribbon with denatured alcohol or head cleaning solution.

- Be careful not to scratch the head surface.



- For easier cleaning of the pinch rollers and capstans rotate them by holding one of the tension arms in operating position and pushing the ▶ button.



Demagnetizing Heads
Residual magnetism will gradually build up on the heads through continuous use and cause an increase of tape noise while recording, and erasure of high frequencies or hiss build-up on your prerecorded tapes. The heads and metallic parts of the tape path should therefore be demagnetized after every 40-50 hours of operation with a commercially available head demagnetizer.

Lubrication
To maintain the optimum performance of the TC-788-4, consult your nearest Superscope Service Station once a year for lubrication and inside check.

Cleaning of the Cabinet
Clean the cabinet, panel and controls with a soft cloth. If finger prints, food and beverage stains, etc. are difficult to remove, use a damp cloth or a mild soap solution. Do not use any type of scouring powder, abrasive pad, or solvent.

TROUBLE SHOOTING GUIDE

If trouble with the TC-788-4 occurs, make the following simple checks to determine whether a professional engineer's skill is required or not. Quite often hi-fi equipment fails to work properly because of incorrectly made system connections or operating errors. If the trouble persists after you have made these checks, consult your nearest Superscope Service Station.

Before entering the list of specified troubles below, first pay attention to the following fundamental points:

- The AC power cord must be connected firmly to the recorder and a wall outlet.
- Don't mix up inputs and outputs, front and back, left and right of the connecting cords. (Refer to page 4). All connections must be done firmly.
- The recorder controls should be left in the positions described on page 10 during normal operation.
- The amplifier volume, balance, mode, function, input selector, and monitor switch settings should be done correctly. Refer to the instruction manual of the amplifier.
- Heads, capstans, and pinch rollers have to be cleaned periodically to ensure optimum performance.

Symptoms	Adjustments
The tape does not move when one of the function buttons is pressed:	• Check for proper tape threading. Make sure there is no slack in the tape and the tension arms are in operating position. Check the PAUSE lever setting.
The tape rubs a reel edge:	• Check the reels for warp and replace them if necessary. Set the Tape-height Adjusters correctly (Refer to page 8).
Recording cannot be made, or the sounds are too low:	• Set the REC MODE switches to REC and push the REC button and ▶ button simultaneously. (Make sure that the red lamp in the REC button and those in the VU-meters are lit.) Clean the record head.
The S/N-ratio of recorded sounds is too low:	• Turn the REC LEVEL controls not in use fully counterclockwise.
Back channel sounds are mixed into the front channels	• Set the PAN POT switch to OFF.
Mic sounds are too low:	• Check the MIC REC LEVEL controls, and push the MIC ATTenuators to OFF. Use low-impedance microphones.
Unbalanced tone in high or low frequencies:	• Check the BIAS and EQ settings. The correct settings for major tape brands are listed on page 10.
Oscillation occurs from the connected speakers when trying to record:	• If the LINE OUTputs of the TC-788-4 are connected to the amplifier AUX inputs and these are switched on, change the amplifier input selector to another position. Switch the speakers off for mic recordings.
Switching pulses from external equipment can be heard on recordings:	• Try to connect the hi-fi equipment to a different AC power line than that being used for washing-machines, dryers, refrigerators, fluorescent lamps or similar appliances. If you can't rewire your house, see that these appliances are not switched during recording.
Previous recordings are not completely erased:	• Clean the erase head.
No or very low sound during playback:	• Clean the heads. Set the MONITOR switches to TAPE. Set the PB VOLUME controls in center click position. Check the amplifier input selector setting. (In case of a normal connection to the tape inputs this will be the monitor switch.) Turn the volume control of the amplifier louder. Check the connections between the recorder LINE OUTputs and the amplifier inputs.
Though playback only had been intended, the program was erased:	• Never forget to move the REC TIMER LOCK lever to the upper position after its use, and switch the REC MODE switches to PB when no recording is intended.
Insufficient sound quality during playback:	• Clean the heads. Switch the REC MODE switches to PB.
Increased tape noise:	• Clean the heads. Demagnetize the hads.
Dropouts, wow or flutter:	• Clean pinch rollers, capstans, and heads. Check the tape for curls of crumbles. Check whether the tape touches the reel edges.
Severe hum	• Connect all GROUND terminals of your stereo equipment with the one of the amplifier, and only this one to an outer ground. (Never make more than one ground connection!) Use shielded connecting cables. Ensure that cables are not near transformers, generators or AC power cords.
No sound from connected headphones:	• Check the HEADPHONE jack used and the HEADPHONE switch setting. (Refer to page 7.) Ensure that the PB LEVEL controls are around center click position. Use 8-ohm headphones.
The power cannot be switched on:	• Check the timer setting, if the TC-788-4 is connected to one.